(12) UK Patent Application (19) GB (11) 2 320 258 (13) A

(43) Date of A Publication 17.06.1998

(21) Application No 9726410.5

(22) Date of Filing 12.12.1997

(30) Priority Data
(31) 19651891 (32) 13.12.1996 (33) DE

(71) Applicant(s)
Trützschler GmbH and Co KG

(Incorporated in the Federal Republic of Germany)

Duvenstrasse 82-92, D-41199 Mönchengladbach, Federal Republic of Germany

(72) Inventor(s)
Ferdinand Leifeld
Stefan Schlichter

(74) Agent and/or Address for Service
Abel & Imray
Northumberland House, 303-306 High Holborn, LONDON, WC1V 7LH, United Kingdom

(51) INT CL[6]
D01G 15/36 , G01N 33/36

(52) UK CL (Edition P)
D1D DXC D1215 D1228

(56) Documents Cited
GB 2019913 A

(58) Field of Search
UK CL (Edition O) D1D , D1N , G3R
INT CL[6] D01G , G01N
Online:WPI

(54) Carding : control of fibre quality

(57) In a carding machine, to control fibre quality, staple fibre length is measured downstream of carding means 4 by sensor 23, and upstream by sensor 25, and compared at 27 to automatically control carding, e.g. be controlling the cylinder drive or the spacing of cylinder and top bar clothing. Fibre length distribution is determined. Measurements of nep count, at the inlet to the machine and by a camera at 24, are also made. A blowing and suction device is described for removing a fibre sample from doffer 5 (Fig. 5, not shown).

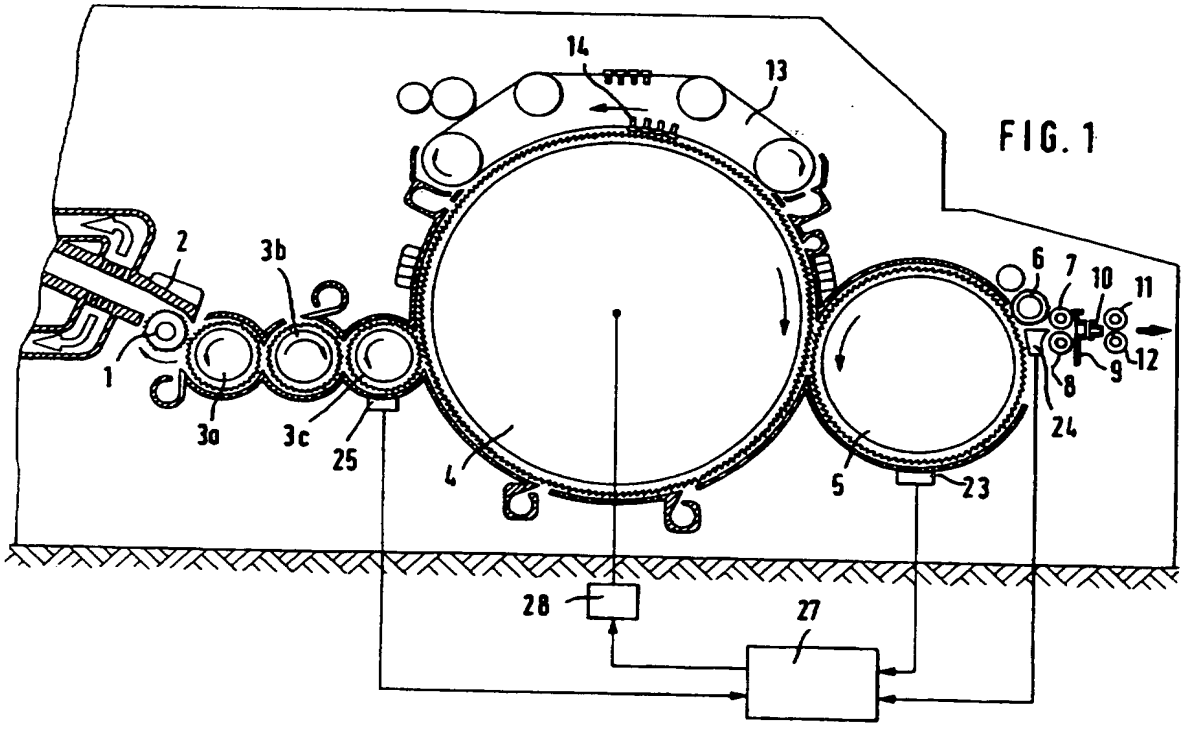
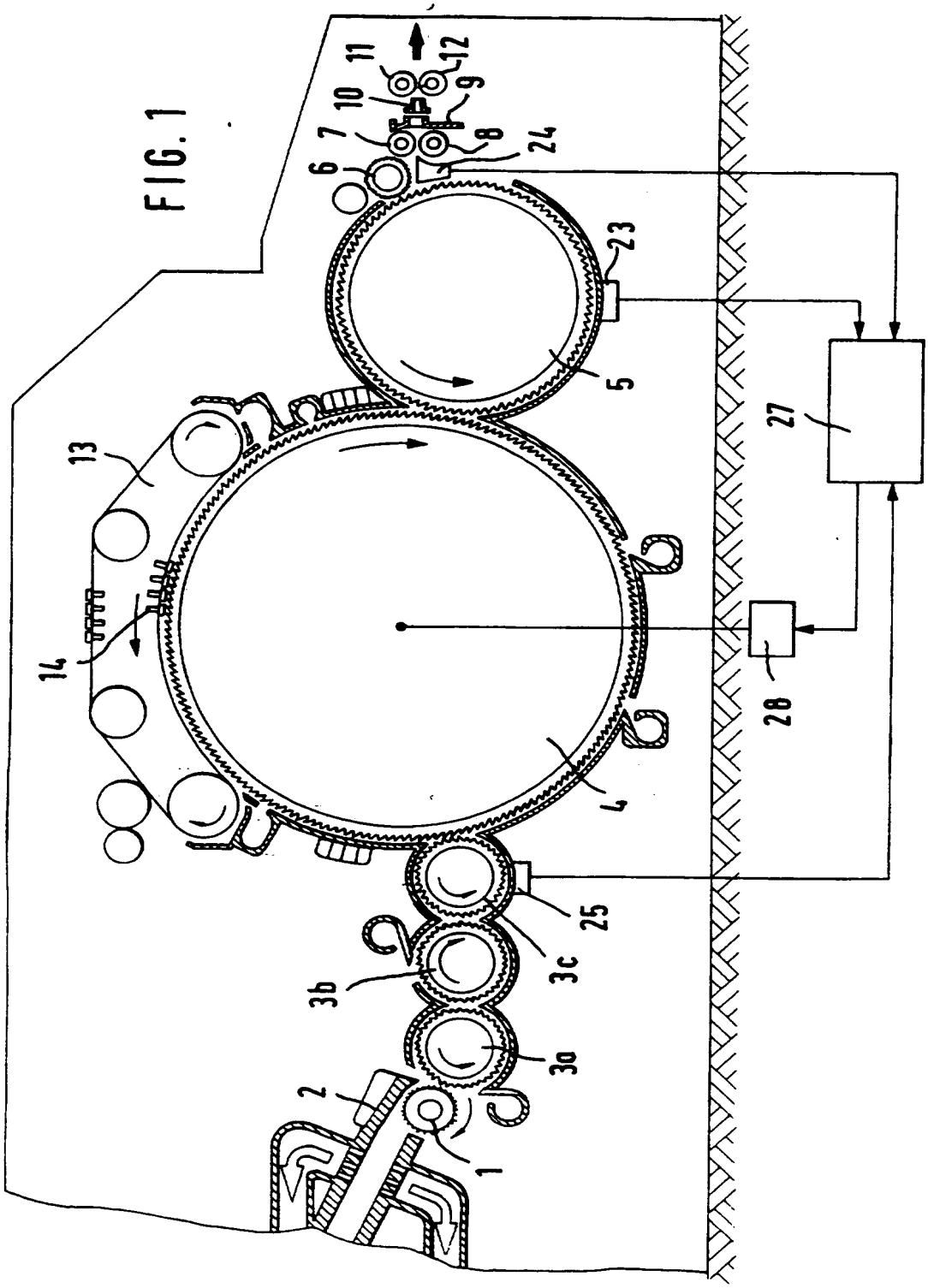


FIG. 1

GB 2 320 258 A

FIG. 1



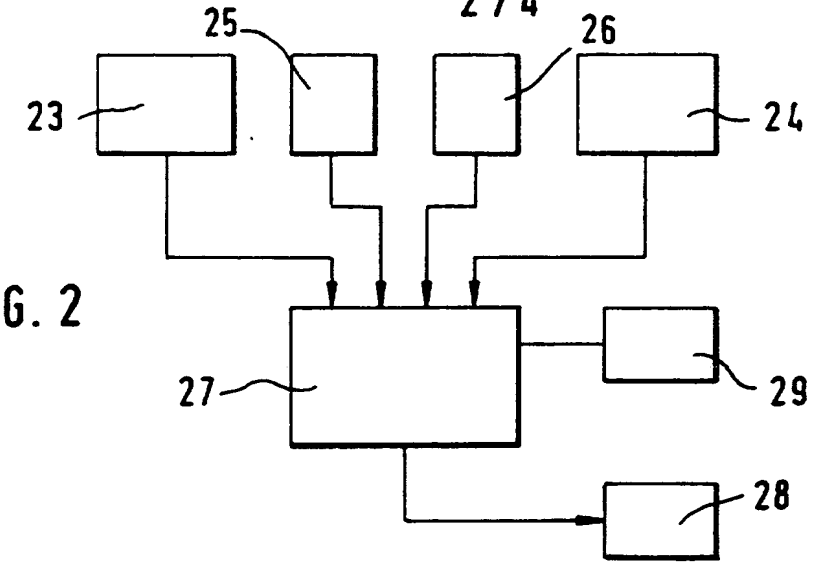


FIG. 2

FIG. 3

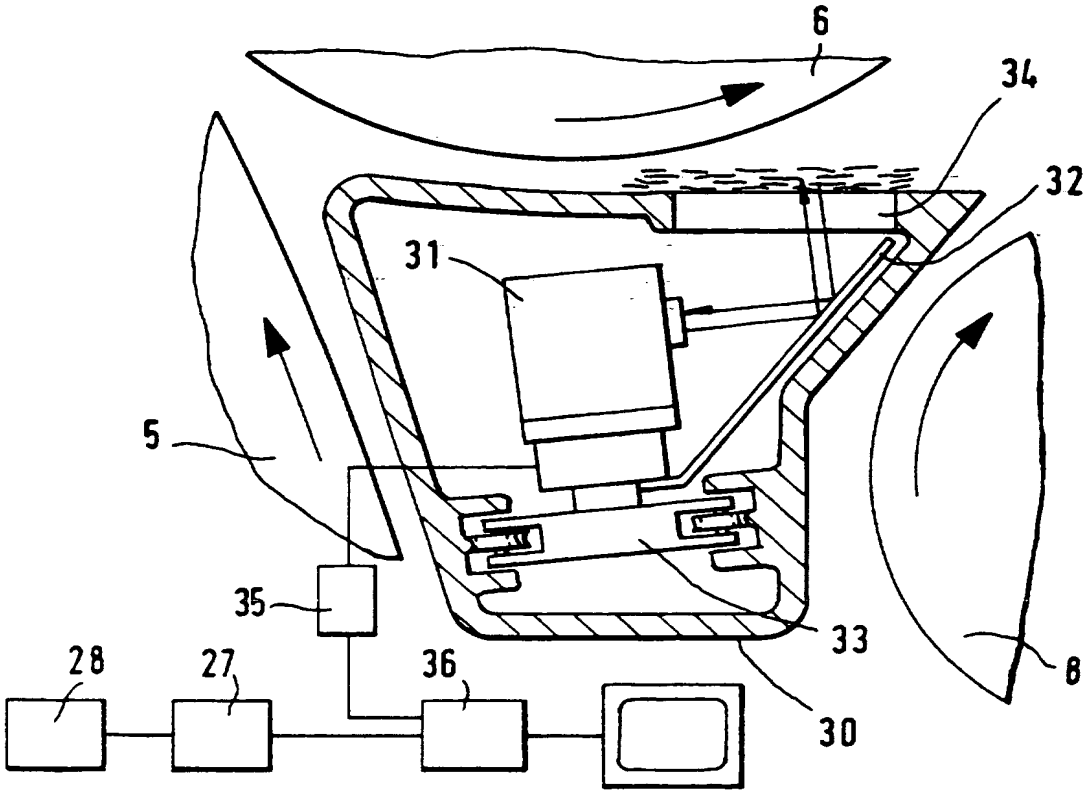


FIG. 4

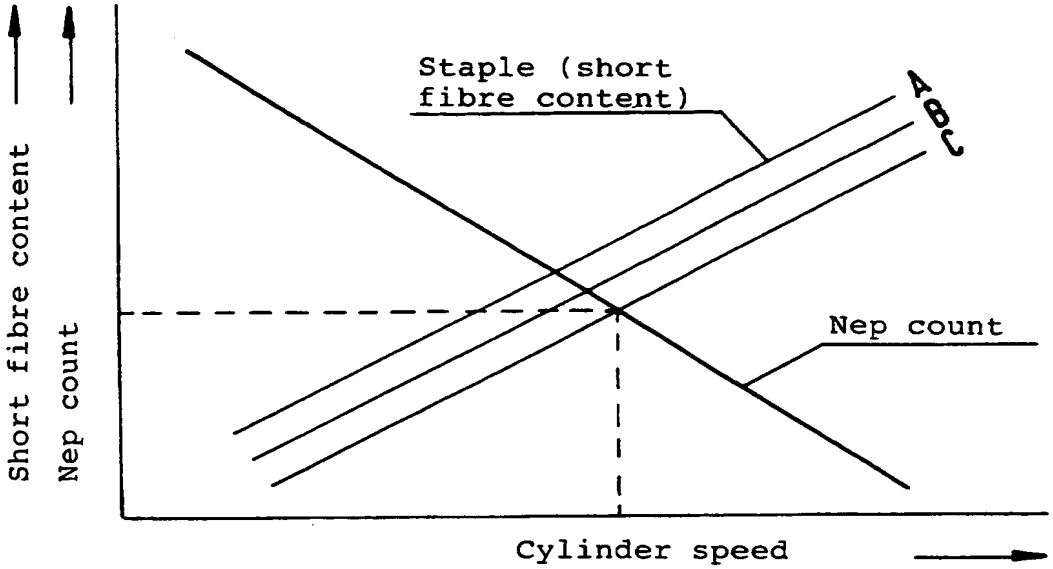

Short fibre content
Nep count
Staple (short fibre content)
ADL
Nep count
Cylinder speed

FIG. 5

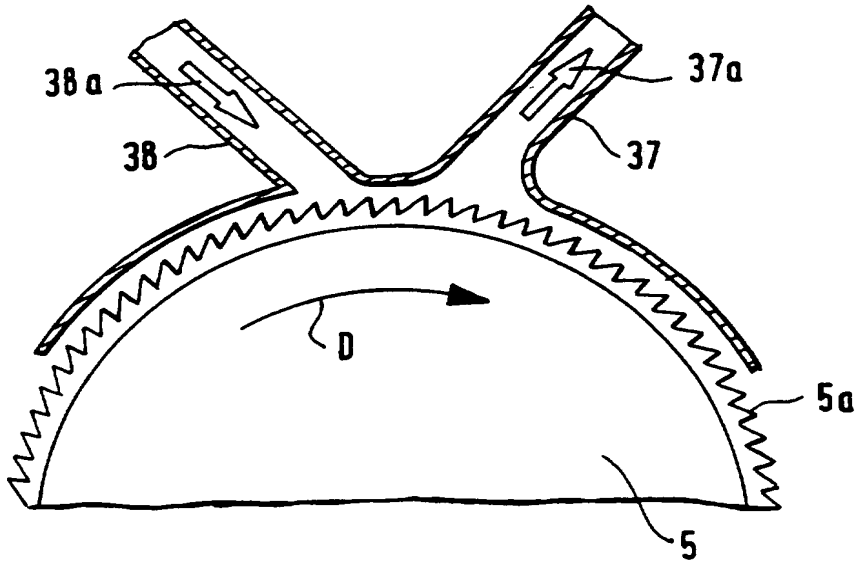
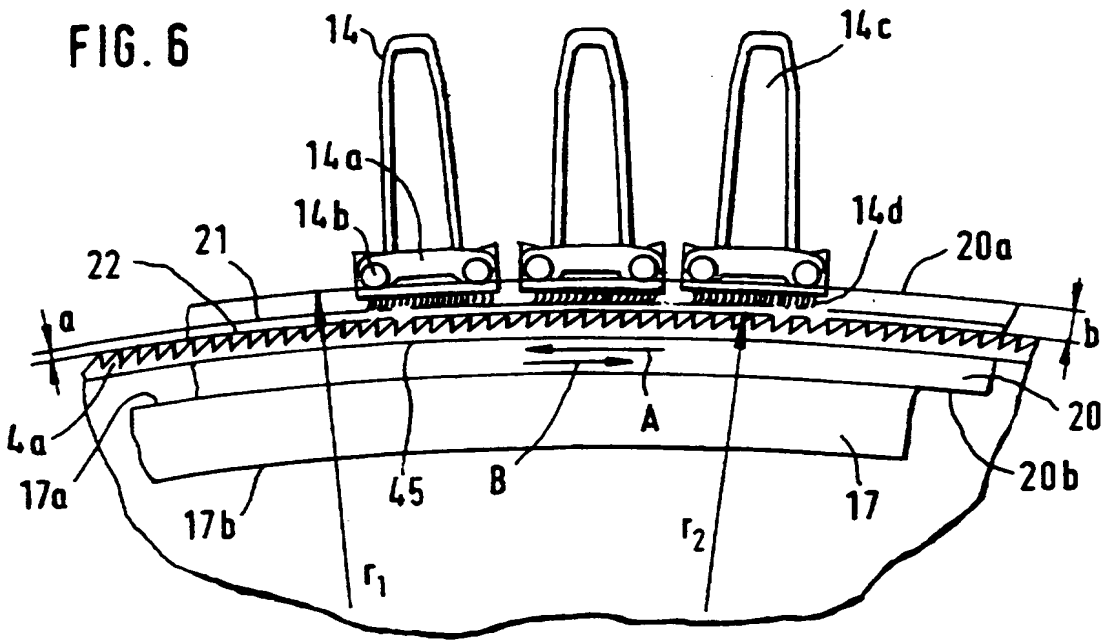

38a
37a
38
37
D
5a
5

FIG. 6


C
14
14c
14a
14b
14d
20a
21
22
a
b
20
A
4a
17a
17b
45
B
17
20b
r_1
r_2

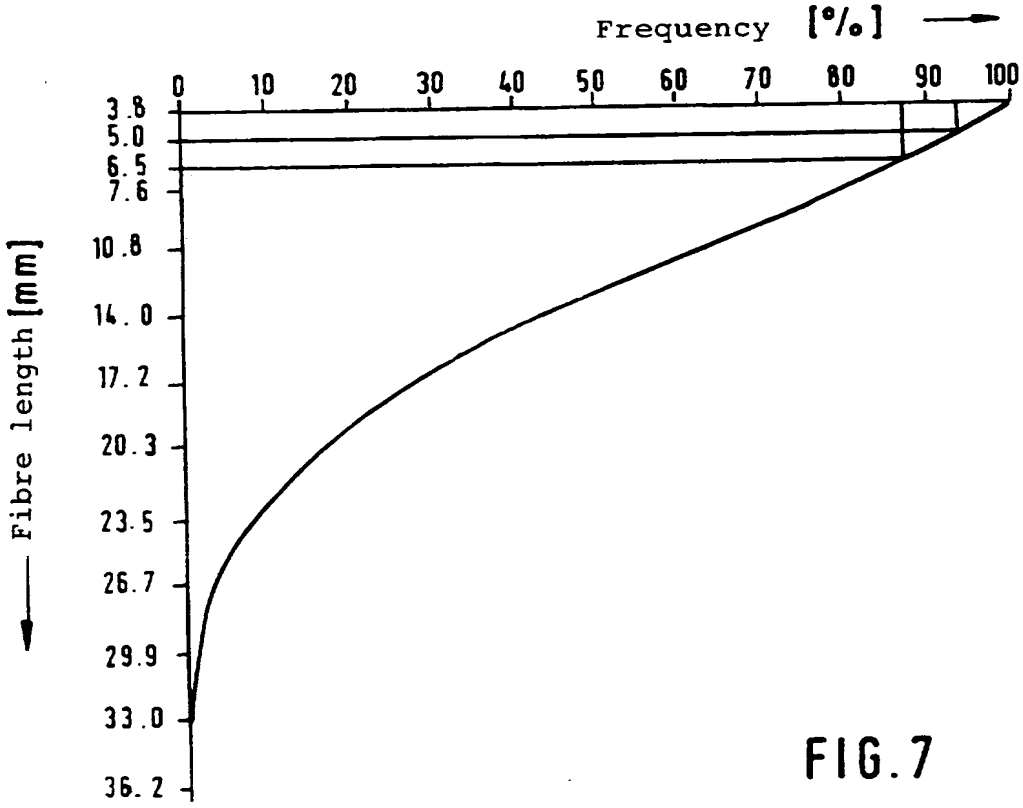

Frequency [%]
0
10
20
30
40
50
60
70
80
90
100
Fibre length [mm]
3.8
5.0
6.5
7.6
10.8
14.0
17.2
20.3
23.5
26.7
29.9
33.0
36.2

FIG. 7

A method and apparatus on a textile - processing machine for achieving improved carding

The invention relates to a method on a carding machine or similar machine for processing textile fibres, for example, cotton, man-made fibres and similar fibres, and to an apparatus for implementing the method.

In a known method, (EP 0 410 429), the staple is measured at the outlet of the carding machine and the measured values must meet quite specific criteria. If automatic control of the carding machine fails to keep these values within the fixed limits, in the first instance attempts are made to improve the corresponding values by resetting the fine cleaning machine. If that fails, it is necessary to make changes to the mixture ratios, which has to be effected by controlling the bale opening machine and ultimately also has repercussions on the bale store. In this method the staple is measured only at the outlet of the carding machine. It is a disadvantage that accurate information about the staple shortening by the carding machine is not possible. It is also a drawback that in the known method it is assumed that an improvement in the staple cannot be achieved on the carding machine itself, on the contrary that a change in the mixture ratios has to be effected.

It is an aim of the invention to provide a method and apparatus which avoids or mitigates the said disadvantages, and which in particular at the carding machine enables steps to be taken for the damage to the fibre (shortening of the fibre) to be reduced.

The invention provides a method of carding textile fibres in which the textile fibres are subjected to carding

by carding means, the method comprising carrying out a first determination of the staple upstream of a said carding means, carrying out a second determination of the staple downstream of that carding means and comparing the values of the staple according to the first and second determinations.

The measures according to the invention enable accurate information about the staple shortening by the carding machine to be obtained. As a result, a reduction in the damage to the fibre (fibre shortening) can be achieved at the carding machine by adjustment of working elements.

A sample is expediently removed, by means of which the fibre lengths are measured. A sample of fibre material is preferably removed, from which the fibre lengths are measured. To measure the fibre length, a small quantity of fibre is advantageously removed by suction at the inlet to and/or at the outlet of the carding machine. Preferably, a blown air current assists the removal by suction. The fibre length is expediently determined from the fibre material at the doffer of the carding machine. The fibre length may be determined from the fibre material at the stripping roller. The fibre length may be determined from the fibre material in the region upstream or downstream of the squeezing rollers. The fibre length may be determined from the fibre material at the or a licker-in. Data for a staple diagram is expediently obtained from the measured values. Removal of the sample of fibre material and measurement of the fibre lengths is preferably effected automatically. The measured values for the staple are advantageously entered as input data in an automatic control system, optimised machine setting data are obtained from the input data for the staple and are supplied to at least one working element influencing the staple at the carding machine. The working element is preferably an element that is able to change the intensity

of carding. The distance between the clothing of the cylinder and the clothings of the revolving card top and/or fixed card top is expediently changed. The fibre length in the fibre material is preferably measured upstream and downstream of the cylinder of the carding machine. The dependency of the staple length on the setting of the working element is preferably used for more than one fibre quality. The input data for the staple is advantageously compared with a stored characteristic curve.

The invention also provides a method on a carding machine or similar machine for processing textile fibres, for example, cotton, man-made fibres and similar fibres, in which at the outlet of the carding machine the staple (fibre length) in the fibre body is measured and an automatic control of the carding machine is provided, in which the staple (fibre length) is also measured at the inlet of the carding machine and from the measured values at the outlet and the measured values at the inlet difference values for the fibre shortening are obtained.

Further, the invention provides an apparatus on a textile machine having at least one carding means, comprising first and second sensor means for determining the staple of fibre material during operation of the carding means, said first sensor means being arranged upstream, and said second sensor means being arranged downstream, of a said carding means in the direction in which, in use of the machine, the textile material travels.

The invention includes an advantageous apparatus on a carding machine or similar machine for processing textile fibres, for example, cotton, man-made fibres and similar fibres, in which the staple (fibre length) in the fibre body is measurable at the outlet of the carding machine and an automatic control of the carding machine is provided, in

which the staple (fibre length) is also measurable at the inlet of the carding machine and from the measured values at the outlet and the measured values at the inlet difference values for the fibre shortening are determinable. The staple is expediently measurable on-line. A sensor for fibre shortening is preferably provided. A fibrograph is advantageously provided for measuring the fibre length distribution. For measuring the fibre lengths a small amount of fibre is preferably removable by suction at the inlet and/or at the outlet of the carding machine. A current of blast air expediently assists the removal by suction. The fibre length is preferably determinable from the fibre material at the doffer of the carding machine. The fibre length is advantageously determinable from the fibre material at the stripping roller. The fibre length is preferably determinable from the fibre material in the region upstream and downstream of the squeezing rollers. The fibre length is expediently determined from the fibre material at the or a licker-in. Data for a staple diagram can preferably be obtained from the measured values. The actuator is advantageously at least one adjusting motor, for example, a stepper motor, for adjusting the distance between the clothing of the cylinder and the clothings of the revolving flat and/or fixed flat. An electronic automatic controlling device, for example, a microcomputer, is preferably provided, to which at least one measuring device for the staple and at least one actuator for a working element influencing the staple are connected. Electrical signals are expediently obtainable from the measured values. The actuator preferably comprises actuating mechanisms for the adjustment of the flexible bends or similar devices of the carding machine.

Certain illustrative embodiments of the invention will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of a carding machine with an apparatus according to the invention;

Fig. 2 is a block circuit diagram of an electronic automatic control device to which at least one nep sensor, a fibre length sensor and a control device, for example, a motor, are connected;

Fig. 3 is a schematic side view of a device beneath the stripping roller of a carding machine for detecting unwanted particles, especially neps, having a camera and a connection to an electronic automatic control device;

Fig. 4 is a graphical representation illustrating the dependency of the short-fibre content and, respectively, the nep count on the speed of rotation of the cylinder for different fibre qualities;

Fig. 5 is a schematic side view of a device for removing small samples of fibres from a clothed roller by means of a suction current and blown current;

Fig. 6 is a schematic side view of a portion of a carding cylinder with card top bars, a section of a slideway and a flexible bend; and

Fig. 7 shows a cumulative frequency diagram for determining data that are entered into the automatic control device for determining the intensity of carding.

With reference to Fig. 1, a carding machine, for example of the type known as the EXACTACARD DK 803 (trade mark) manufactured by Trützschler GmbH & Co. KG, has a feed roller 1, a feed table 2, licker-ins 3a, 3b, 3c, a cylinder

4, a doffer 5, a stripping roller 6, squeezing rollers 7, 8, a web-guide element 9, a web funnel 10, take-off rollers 11, 12 and revolving card top 13 with card top bars 14. A measuring element (sensor) 23 for the fibre length (staple) is arranged beneath the doffer 5 and a measuring element 24 for the nep count in the fibre web is arranged beneath the stripping roller. A measuring element 25 for the fibre length is present beneath the licker-in 3. It will be appreciated that references herein to measurement of fibre length include the determination of the fibre length distribution. The measuring elements 23, 24 and 25 are linked to an electronic automatic control system 27, for example, a microcomputer, downstream of which a variable-speed motor is arranged as actuator 28 for the drive of the cylinder 4. The directions of rotation of the rollers are shown by curved arrows.

Fig. 2 shows one suitable form of arrangement for control of a carding machine in response to measured values of nep count and staple. The measuring element 23, the measuring element 24, a measuring element 25 for the fibre length at the inlet to the carding machine, for example, at the licker-in 3, a measuring element 26 for the nep count at the inlet to the carding machine, a set value adjuster 29 and the actuator 28 are connected to the automatic control system 27. The actuator 28 can be, for example, a motor, which changes the distance between the clothings of the card top bars 14 and the clothing of the cylinder 4 (see Fig. 6) and thus the intensity of carding.

As measuring element 24 for automatic detection of the nep count to the electronic automatic control system 27, for example, a microcomputer there may be connected for example a nep counting device of the type known as the NEPCONTROL NCT (trade mark) and manufactured by Trützschler GmbH & Co.

KG. The measured values for the fibre length, which are determined, for example, by a fibrograph, can also be entered in the electronic automatic control system 27 by way of an input device. A switch element, for example, a push-button or similar device, can also be connected to the electronic automatic control system 27 with which the motor for the actuator 28 is operated. Furthermore, a measuring element for detecting the distance a between the tips 21 of the card top clothings 14d and the tips 22 of the cylinder clothing 4a, for example of the type known as the FLAT CONTROL FCT (trade mark) and manufactured by Trützschler GmbH & Co. KG, can be connected to the electronic automatic control system 27.

With reference to Fig. 3, as measuring element 24 for automatic detection of the nep count, there is provided, for example, a NEPCONTROL NCT manufactured by Trützschler GmbH & Co. KG. Beneath the stripping roller 6 is a supporting and guiding element 30, in the interior of which a camera 31 and an illuminating device (not illustrated) and a deflecting mirror 32 are arranged on a carriage 33. On the outside of a window 34 runs the fibre web of which the nep count is being determined. The camera 31 is linked by way of a computer 35 to an image processor 36, which is connected to the electronic automatic control system 27, downstream of which is arranged the actuator 28. The actuator 28 can initiate measures to change the nep count and the fibre shortening, for example changes in the distance a between the clothings of the flat bars 14 and the clothing of the cylinder 4, in the speed of rotation of the cylinder 4, in the spacing of a blade from a roller, for example the licker-in 3, in the spacing of a guide element, and so on.

With reference to Fig. 4, as the speed of rotation of the cylinder 4 increases, the nep count decreases and the

fibre shortening increases (as illustrated by the parameter Short Fibre Content in Fig. 4). The dependency of the fibre shortening is illustrated for fibre qualities A, B and C. The point of intersection between the curves for the nep count and for the fibre shortening forms the optimum (see broken lines). This optimum is calculated and determined in the automatic control system 27 from the entered curves for the nep count and for the fibre shortening. In this process a comparison with characteristic curves that are present in the set value memory 29 is effected.

With reference to Fig. 5, above the doffer 5 there is a suction device 37, for example a tube or the like, with which a small amount of fibre is sucked from the clothing 5a of the doffer 5 by means of a suction current 37a; the fibre amount is subsequently analysed in order to determine its fibre length distribution. The amount of fibre is so small that it has virtually no effect on the uniformity of the fibre sliver produced. In the manner of a sampling test, several times very small amounts are removed by suction and analysed. Inter alia a staple diagram or data for such a diagram are produced from the analyses. A blowing device 38, for example, a tube, is mounted upstream of the suction device 37 in the direction of rotation D, the blown current 38a of which blowing device is directed obliquely onto the clothing 5a in the direction of rotation D and assists the removal of the sample by suction. The suction device 37 is aligned obliquely with respect to the clothing 5a against the direction of rotation D.

With reference to Fig. 6, on each side of the carding machine a flexible bend 17 is secured by screws laterally to the machine frame, the flexible bend having several adjusting screws. The flexible bend 17 has a convex outer surface 17a and an underside 17b. Above the flexible bend

17 there is a slideway 20, for example, of non-stick plastics material, which has a convex outer surface 20a and a concave inner surface 20b. The concave inner surface 20b lies on the convex outer surface 17a and is able to slide thereon in the direction of the arrows A, B. The card top bars 14 have at each end a card top head 14a to which are secured in the axial direction two steel pins 14b which slide on the convex outer surface 20a of the slideway 20 in the direction of the arrow C. The card top clothing 14d is mounted on the lower surface of the carrier element 14c. The reference numeral 21 denotes the circle defined by the tips of the card top clothings 14d. The cylinder 4 has on its circumference a cylinder clothing 4a, for example, a saw-tooth clothing. The reference numeral 22 denotes the circle defined by the tips of the cylinder clothing 4a. The distance between the tip circle 21 and the tip circle 22 is denoted by the letter a and is, for example, 0.20 mm. The distance between the convex outer surface 20a and the tip circle 22 is denoted by the letter b. The radius of the convex outer surface 20a is denoted by r_1, and the radius of the tip circle is denoted by r_2. The radii r_1 and r_2 intersect at the midpoint M of the cylinder 4. By means of an actuator 28 (not illustrated), for example, a motor, the slideway can be displaced locally in the radial direction r_1, with the result that the distance a, and thus the intensity of carding, are changed. The means for displacement of the slideway may, for example, be of a type described in our co-pending application No. ... (ref. no. 2897, filed on the same date as the present application).

A sample is taken from the fibre material on the doffer 5 so that an analysis can be made which will later serve to adjust the intensity of carding performed by the carding

machine. This analysis is carried out, for example, by means of a fibrograph, which reproduces the length distribution of the fibres in the form of a fibrogram (fibre tuft curve). Such a diagram is shown in Fig. 7. The frequency in percent is plotted on the horizontal axis and the fibre length in millimetres is plotted on the vertical axis. The fibrogram shown as an example in Fig. 7 shows that 100% of all fibres have a length of at least 3.8 mm. About 93% of all fibres have a length of more than 5 mm, and about 88% of all fibres have a length of more than 6.5 mm. As the diagram shows, the proportion of fibres in the total amount of fibres decreases as the fibre length becomes longer, until ultimately at fibre lengths of more than about 34 mm there are no more fibres. Fibres below 5 to 6.5 mm in length have proved not to contribute to the strength of the spun thread. For that reason, using the curve shown in Fig. 7, it is possible to detect how many percent of all fibres have a length that is smaller than the set minimum length of 5 to 6.5 mm. The fibrogram shows, for 5 mm, for example, that 7% of all fibres are shorter than 5 mm. The same curve shows that 12% of all fibres are shorter than 6.5 mm. This 7 to 12 % serves, as already stated above, for adjustment of the intensity of carding performed by the carding machine. The data for the staple diagram are entered in the electronic automatic control system 27. From this data and from the data for the nep count the system calculates the optimum value, which serves to adjust the intensity of carding performed by the carding machine.

Using the method or the apparatus according to the invention, it is also possible, in so far as this is desirable in specific cases, for example corresponding to Fig. 4 at a specific speed of rotation of the cylinder, to reach a pair of values for the short fibre content and the

nep count away from the intersection point of the two curves.

Claims

1. A method of carding textile fibres in which the textile fibres are subjected to carding by carding means, the method comprising carrying out a first determination of the staple upstream of a said carding means, carrying out a second determination of the staple downstream of that carding means and comparing the values of the staple according to the first and second determinations.

2. A method according to claim 1, in which from the fibre material a sample is removed, from which the fibre lengths are measured.

3. A method according to claim 1 or claim 2, in which to measure the fibre lengths a small quantity of fibre is removed by suction at the inlet to and/or at the outlet of the carding machine.

4. A method according to claim 3, in which a current of blown air assists the removal by suction.

5. A method according to any one of claims 1 to 4, in which the fibre length is determined from the fibre material at the doffer of the carding machine.

6. A method according to any one of claims 1 to 5, in which the fibre length is determined from the fibre material at the stripping roller.

7. A method according to any one of claims 1 to 6, in which the fibre length is determined from the fibre material in the region immediately upstream or downstream of the squeezing rollers.

8. A method according to any one of claims 1 to 7, in which the fibre length is determined from the fibre material at the or a licker-in.

9. A method according to any one of claims 1 to 8, in which data for a staple diagram are obtained from the measured values.

10. A method according to any one of claims 1 to 9, in which removal of the or each sample and measurement of the fibre length are effected automatically.

11. A method according to any one of claims 1 to 10, in which the measured values for the staple are entered as input data in an automatic control system, optimised machine setting data are obtained from the input data for the staple and are supplied to at least one working element influencing the staple at the card.

12. A method according to claims 11, in which said at least one working element changes the intensity of carding.

13. A method according to claim 11 or claim 12, in which the distance between the clothing of the cylinder and the clothings of the revolving card top and/or fixed card top is changed.

14. A method according to any one of claims 1 to 13, in which the dependency of the staple length on the setting of the working element is used for more than one fibre quality.

15. A method according to any one of claims 1 to 14, in which the fibre length in the fibre material is measured upstream and downstream of the cylinder of the carding machine.

16. A method according to any one of claims 1 to 15, in which the input data for the staple is compared with a stored characteristic curve.

17. A method on a carding machine or similar machine for processing textile fibres, for example, cotton, man-made fibres and similar fibres, in which at the outlet of the carding machine the staple (fibre length) in the fibre body

is measured and an automatic control of the carding machine is provided, in which the staple (fibre length) is also measured at the inlet of the carding machine and from the measured values at the outlet and the measured values at the inlet difference values for the fibre shortening are obtained.

18. A method of carding textile fibres according to claim 1, said method being substantially as described herein with reference to and as illustrated by any one of Figs. 1 to 7.

19. An apparatus on a textile machine having at least one carding means, comprising first and second sensor means for determining the staple of fibre material during operation of the carding means, said first sensor means being arranged upstream, and said second sensor means being arranged downstream, of a said carding means in the direction in which, in use of the machine, the textile material travels.

20. An apparatus according to claim 19, which further comprises control and regulation means for evaluating the signals from said first and second sensor means and controlling an element of the textile machine in response thereto.

21. An apparatus according o claim 19 or claim 29, in which the staple is measurable on-line.

22. An apparatus according to any one of claims 19 to 21, in which sensing means for determining fibre shortening is provided.

23. An apparatus according to any one of claims 19 to 22, in which a fibrograph is provided for measuring the fibre length distribution.

24. An apparatus according to any one of claims 19 to 23, in which means for removing a small amount of fibre for

measurement of the fibre lengths is provided at the inlet and/or at the outlet of the textile machine.

25. An apparatus according to claim 24, in which the or each fibre removing means comprises a suction device.

26. An apparatus according to claim 25, in which blowing means is provided for generating a blast current that assists the removal by suction.

27. An apparatus according to any one of claims 19 to 26, in which the textile machine is a carding machine.

28. An apparatus according to claim 27, in which means are provided for determining the fibre length of the fibre material at the doffer of the carding machine.

29. An apparatus according to claim 27 or claim 28, in which means are provided for determining the fibre length of the fibre material at a stripping roller.

30. An apparatus according to any one of claims 27 to 29, in which means are provided for determining the fibre length of the fibre material in the regions upstream and downstream of the squeezing rollers.

31. An apparatus according to any one of claims 27 to 30, in which there is provided means for determining the fibre length of the fibre material at the or a licker-in.

32. An apparatus according to any one of claims 27 to 31, which further includes actuating means comprising at least one adjusting motor, for example, a stepper motor, for the adjustment of the distance between the clothing of the cylinder and the clothings of the revolving card top and/or fixed card top.

33. An apparatus according to any one of claims 27 to 32, which further includes actuating means comprising actuating mechanisms for adjustment of the flexible bends, slideways or similar devices of the carding machine.

34. An apparatus according to any one of claims 19 to 33, which further comprises means for converting the measured values into a staple diagram.

35. An apparatus according to any one of claims 19 to 34, in which an electronic automatic control system, for example, a microcomputer, is provided, to which at least one measuring device for the staple and at least one actuator for a working element influencing the staple are connected.

36. An apparatus according to any one of claims 19 to 35, in which electrical signals are obtainable from the measured values.

37. An apparatus on a carding machine or similar machine for processing textile fibres, for example, cotton, man-made fibres and similar fibres, in which at the outlet of the carding machine the staple (fibre length) in the fibre body is measurable and an automatic control of the carding machine is provided for implementing the method according to any one of claims 1 to 18, in which the staple (fibre length) is also measurable at the inlet of the carding machine and from the measured values at the outlet and the measured values at the inlet difference values are determinable for the fibre shortening.

38. An apparatus for determining the change in the fibre length profile of fibre material being processed in a textile machine, the apparatus being substantially as described herein with reference to any of Figs. 1 to 7.

The Patent Office

17

Application No:	GB 9726410.5	**Examiner:**	G WERRETT
Claims searched:	1-38	**Date of search:**	6 February 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): D1D, D1N, G3R.

Int Cl (Ed.6): D01G, G01N.

Other: Online:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2019913 A	(ZELLWEGER) see Figs. 1 & 2, examination of fibres up- & down-stream of carding engine.	1, 17, 19, 37.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.